

"On the Structure and Affinities of Fossil Plants from the Palaeozoic Rocks.—V. On a New Type of Sphenophyllaceous Cone (*Sphenophyllum fertile*) from the Lower Coal-measures." By D. H. SCOTT, M.A., Ph.D., F.R.S. Honorary Keeper of the Jodrell Laboratory, Royal Botanic Gardens, Kew. Received November 22,—Read December 1, 1904.

(Abstract.)

The class Sphenophyllales, of which the fossil described is a new representative, shows on the one hand clear affinities with the Equisetales, while on the other it approaches the Lycopods; some botanists have endeavoured to trace a relation to the Ferns. The nearest allies among recent plants are probably the Psilotaceæ, which some writers have even proposed to include in the Sphenophyllales.

The new strobilus appears to find its natural place in the type-genus *Sphenophyllum*, as at present constituted, but it possesses peculiar features of considerable importance, which may probably ultimately justify generic separation. The specimen, of which a number of transverse and longitudinal sections have been prepared by Mr. Lomax, is from one of the calcareous nodules of the Lower Coal-Measures of Lancashire, and was found at Shore Littleborough, a locality rich in petrified remains, now being opened up by the enterprise of the owner, Mr. W. H. Sutcliffe.

The close affinity of the strobilus with *Sphenophyllum* is shown by the anatomy of the axis, which has the solid triarch wood characteristic of that genus, and by the fact that the whorled sporophylls are divided into dorsal and ventral lobes, as in all other known fructifications of this class. But, whereas, in all the forms hitherto described, the lower or dorsal lobes are sterile, forming a system of protective bracts, while the ventral lobes alone bear the sporangia; in the new cone, dorsal and ventral lobes are alike fertile, and no sterile bracts are differentiated. On this ground the name *Sphenophyllum fertile* is proposed for the new species.

Each lobe of the sporophyll divided palmately into several segments, the sporangiophores, each of which consisted of a slender pedicel, terminating in a large peltate lamina, on which two pendulous sporangia were borne. In the bi-sporangiate character of the sporangiophores, and in other details of structure, *Sphenophyllum fertile* approaches the *Bowmanites Römeri* of Count Solms-Laubach, while in the form and segmentation of the sporophylls there is a considerable resemblance to the Lower Carboniferous genus *Cheirostrobus*.

The wall of the sporangium has a rather complex structure, the most interesting feature in which is the well-defined small-celled stomium, marking the line of longitudinal dehiscence.

The spores, so far as observed, are all of one kind; they are ellipsoidal in form, with longitudinal crests or ridges; their dimensions are 90—96 μ in length by 65—70 μ in width.

The most characteristic point in the structure of the new cone—the fertility of both dorsal and ventral lobes of the sporophyll—is regarded as more probably due to special modification than to the retention of a primitive condition.

“On the Convergence of Infinite Series of Analytic Functions.”

By H. A. WEBB, B.A., Fellow of Trinity College, Cambridge.
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(Abstract.)

Consider the differential equation

$$\frac{d^2y}{dz^2} + k^2 Qy = 0,$$

where

$$Q = Q_0 + \frac{Q_1}{k} + \frac{Q_2}{k^2} + \dots,$$

$\sqrt{Q_0}, Q_1, Q_2, \dots$, are one-valued analytic functions of z , independent of k , k is a constant, and the series defining Q is convergent for all values of k , such that

$$|k| > R,$$

except at the singularities of the functions

$$Q_0, Q_1, Q_2, \dots$$

Exclude points in the z -plane indefinitely near these singularities.

The series

$$y = e^{ik\omega} \left(\phi_0 + \frac{\phi_1}{k} + \frac{\phi_2}{k^2} + \dots \text{ad inf.} \right) \\ + e^{-ik\omega} \left(\psi_0 + \frac{\psi_1}{k} + \frac{\psi_2}{k^2} + \dots \text{ad inf.} \right),$$

where ω, ϕ, ψ are functions of z independent of k , can be formally and uniquely constructed to represent any given particular integral of the differential equation.

For all values of z not excluded the series

$$\phi_0 + \frac{\phi_1}{k} + \frac{\phi_2}{k^2} + \dots, \quad \psi_0 + \frac{\psi_1}{k} + \frac{\psi_2}{k^2} + \dots$$

are convergent, and when k is very large,

$$e^{ik\omega}\phi_0 + e^{-ik\omega}\psi_0$$

is an approximate value of the integral.